

(51) Int.Cl. ⁶	識別記号	庁内整理番号	F I	技術表示箇所
F 1 6 F 13/18			F 1 6 F 13/00	Q
B 6 0 K 5/12			B 6 0 K 5/12	F

審査請求 未請求 請求項の数 1 O L (全 5 頁)

(21) 出願番号 特願平7-162708

(22) 出願日 平成7年(1995)6月28日

(71) 出願人 000005278

株式会社ブリヂストン

東京都中央区京橋1丁目10番1号

(72) 発明者 松田 尚久

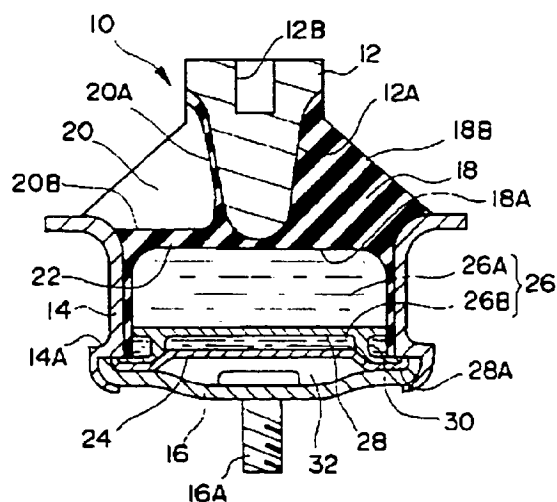
神奈川県横浜市戸塚区柏尾町150-7-428

(54) 【発明の名称】 防振装置

(57) 【要約】

【目的】 簡易で安価な構成で広範囲な帯域の振動を有効に吸収し得る防振装置を提供する。

【構成】 液室26に臨む弾性体18の一部が肉厚の薄い薄肉部22となるよう液室26とは反対側の弾性体18部分に切欠凹部20を設け、さらに、この切欠凹部20は軸直交方向外方に向かって開放されるよう凹設される。



【特許請求の範囲】

【請求項1】 振動発生部および振動受部の一方に連結される外筒と、振動発生部および振動受部の他方に連結されるセンター部材と、前記外筒と前記センター部材との間に介在配設されたゴム状弾性体と、このゴム状弾性体を隔壁の一部とし且つ液体が封入された液室とを備えた防振装置であって、前記液室に臨む前記ゴム状弾性体の一部が肉厚の薄い薄肉部となるよう、前記液室とは反対側となる前記ゴム状弾性体部分に切欠凹部を設け、さらに、この切欠凹部は少なくとも軸直交方向外方に向かって開放されるよう凹設されてなることを特徴とする防振装置。

【発明の詳細な説明】

【0001】

【産業上の利用分野】この発明は、振動発生部からの振動の伝達を防止する場合等に適用される防振装置に関し、例えばエンジン振動の車体への伝達を阻止するためのエンジンマウント、その他車両用及び一般産業機体等に適用可能なものである。

【0002】

【従来の技術】例えば、車両の振動発生部となるエンジンと振動受部となる車体との間にエンジンマウントとしての防振装置が配設されていて、エンジンが発生する振動をこの防振装置が吸収し、車体側に伝達されるのを阻止するようになっている。すなわち、このような防振装置の一例として、図1に示すような防振装置110が知られており、この図に基づき従来技術を説明する。

【0003】この防振装置110は、エンジン側のブラケットに取り付けられるセンター部材112と外筒114との間にゴムからなる弾性体116が設けられ、外筒114および弾性体116の内側には液体を封入した液室118が設けられると共にゴム膜からなるダイヤフラム120でこの液室118が密閉されることによって構成される。液室118内は隔壁部材122によって一対の液室118A、118Bに区画され、制限通路124によってこれらの液室118A、118Bが互いに連通されている。この隔壁部材122およびダイヤフラム120は、外筒114の開口部分に蓋部材126を固定する際にこの両者に挟持されることによって取り付けられる。蓋部材126はボルト126Aによって車体側に取り付けられ、従って、蓋部材126と一体の外筒114はこの蓋部材126を介して車体側に取り付けられている。そして、搭載されたエンジンが作動して振動が発生した場合には、弾性体116の制振機能および液室118A、118Bを連通する制限通路124内の液体の液柱共振等で、減衰力を発生させて振動を吸収し、振動の伝達を阻止するようになっている。

【0004】

【発明が解決しようとする課題】しかし、前述のような防振装置110では、低周波数域の振動が制限通路12

4を液体が流通することによって減衰されるのに対し、これより高周波数域の振動が伝達されると、制限通路124の目詰まりにより、液室118Aの内圧が上昇してばね係数が高まり、結果として、十分に振動を低減出来ないという欠点を有していた。

【0005】また、この欠点を解決すべく、図5に示されるような隔壁部材122に往復動可能な可動片128を備えたもの、あるいは可動片128の替わりにゴム膜からなるメンブランを備えたものが提案されているが、これらのものは、構造が複雑となり、製造が煩雑で部品点数が多くなってコストアップする欠点が生ずる。

【0006】またさらに、図6、図7に示されるように、弾性体116に凹部130を設けて薄肉部132を形成し、液室118Aの内圧が上昇するのを防止する構成のものも提案されているが、図5のものは、液室側に凹部130が形成されているため液室内に封入される液体の量が増加し、装置重量が増加する不具合が生じてしまい、図6のものは、図中上方へ成型型を離型させて凹部130を軸方向に凹設させているため、凹部130内に異物が溜まり易く、また一旦異物が入り込むと排出され難い。さらには例えば段付き等の外径が異なるセンター部材を用いた場合には、成型型の離型の関係からこのセンター部材の最外径より中心側に凹部130が形成できないため薄肉部の面積が十分に確保でき難く、そしてこれらのことは装置の特性に悪影響を与えることにもなる。

【0007】本発明は上記事実を考慮し、簡易な構成で広範囲な帯域の振動を有効に吸収し得る防振装置を提供することを目的とする。

【0008】

【課題を解決するための手段】本発明は、振動発生部および振動受部の一方に連結される外筒と、振動発生部および振動受部の他方に連結されるセンター部材と、前記外筒と前記センター部材との間に介在配設されたゴム状弾性体と、このゴム状弾性体を隔壁の一部とし且つ液体が封入された液室とを備えた防振装置であって、前記液室に臨む前記ゴム状弾性体の一部が肉厚の薄い薄肉部となるよう、前記液室とは反対側となる前記ゴム状弾性体部分に切欠凹部を設け、さらに、この切欠凹部は少なくとも軸直交方向外方に向かって開放されるよう凹設されてなるものである。

【0009】

【作用】本発明の上記構成によれば、振動発生部側からセンター部材あるいは外筒に振動が伝達されると、弾性体に変形すると共に液室内の液体に圧力変化が生じ、弾性体および液体により振動が減衰されて振動受部側に振動が伝達され難くなる。また、液室の隔壁を構成する弾性体には切欠凹部により薄肉部が形成されているため、弾性体および液体によっては減衰できないような高周波の振動が振動発生部側から伝達された場合でも、この薄

内部が弾性変形して低動ばねとなり、振動受部側に振動が伝達され難くなる。

【0010】さらに、切欠凹部は弾性体の液室側ではなく外側に形成されるので、液室側に凹部を形成するのに比べ、液室内に封入される液体の量が増加せず少量で済み、その分の軽量化が可能である。また、切欠凹部は少なくとも軸直交方向外方に向かって開放されるよう凹設されるので、切欠凹部に異物が溜まり難く、また異物が入り込んでも容易に排出され易く、適切な振動減衰が出来るようになる危惧がない。また弾性体の加硫成形時に型抜きが容易に行えて製造が簡易である。

【0011】

【実施例】以下に、この発明の好適な実施例を図面を参照して説明する。

【0012】図1に示す実施例では、防振装置10の上部側を形成する鋼製で略円錐形状のセンター部材12の中央部分には、図示しないエンジンにこの防振装置10を連結して固着するためのボルト孔12Bが設けられている。このセンター部材12の下方側の周囲はテーパ状の壁部12Aとなっている。一方、外筒14は鋼板製で円筒状に形成されている。そしてこの外筒14の径方向内方の中心軸線位置で且つ軸線方向にはずれた位置にセンター部材12が配置される。外筒14の下部側開口部には、鋼板製の蓋部材16がかしめ固定され、この蓋部材16はボルト16Aを有しこのボルト16Aによって図示しない車体側部材に取り付けられる。従って、外筒14は蓋部材16と一体的に組付固定されることによって車体側に連結されることとなる。

【0013】また、センター部材12と外筒14との間には、概ね円錐台形状をしたゴム製の弾性体18が配設されている。すなわち、弾性体18はその中央部分でセンター部材12の壁部12Aに加硫接合されて取り付けられており、弾性体18の下部周縁部分で外筒14の上部内周側に加硫接合されて取り付けられている。弾性体18の下面18Aは後述するように液室の隔壁の一部として構成され、また弾性体18は外筒14との固着部分から外筒14の内周下端まで膜状に延設されている。

【0014】弾性体18は、その傾斜面18Bの一部分に切欠凹部20が形成されるように加硫成形されている。この切欠凹部20は、センター部材12に沿って立ち上がった立壁部20Aと軸直交方向に沿って延設された底面20Bとで構成される。

【0015】ここで底面20Bは、図2に示されるように一辺が円弧で且つこの一辺に向かって内方から外方へ拡開された略扇形形状とされ、これによって切欠凹部20が径方向外方に開放されている。また、底面20Bの内方側は、センター部材12の最外径（ボルト孔12B形成部分側の径）よりも中心軸線側に入り込むように形成されている。また、この底面20Bは下面18Aに対し平行な面となるよう形成されており、従って、この両

面の間の弾性体18は肉厚が薄く形成されて薄肉部22となっている。なお本実施例では薄肉部22の肉厚が2～4mmに形成されている。一方、立壁部20Aは、底面20Bの内方側においてセンター部材12に沿って立ち上がり、また内方側および円弧辺部分以外においては略垂直に立ち上がるよう形成される。

【0016】外筒14の下端には、その開口部分を覆うようにゴム膜からなるダイヤフラム24が組み付けられている。そして弾性体18、外筒14およびダイヤフラム24によって囲まれた密閉空間は、例えば水、エチレングリコール等の液体が封入されて液室26が設けられる。さらに、この液室26内には、円板状に形成された合成樹脂製の隔壁板28が配置されている。この隔壁板28は、液室26を一对の液室である受圧液室26Aと副液室26Bとに二分して区画している。また、隔壁板28の周縁には断面コ字状に開口した周溝が形成されており、隔壁板28を外筒14内方に組み付ける際に前記周溝の開口が外筒14の内周壁面と塞がれることによって、リング状の空間である制限通路30が形成される。なお、この制限通路30は、隔壁板28の周囲に半周に渡ってあるいはほぼ全周にわたって形成されており、その一端は透孔30Aによって受圧液室26Aと連通し、また他端は透孔30Bによって副液室26Bと連通している。

【0017】隔壁板28には、径方向外方に突出した支持部28Aが形成されており、この支持部28Aはダイヤフラム24の周縁部と共に外筒14のフランジ部14Aと蓋部材16とで挟持固定される。ダイヤフラム24と蓋部材16との間の空間は空気室32とされて、ダイヤフラム24の変形を可能としている。

【0018】図3は、弾性体18の加硫成形による製造を説明するためのもので、成型型34は、上成型型34A、成型型34B、成型型34C、下成型型34D、成型型34E、成型型34Fに分割されて構成され、各成型型は図中矢印で示されたように相対的にスライド可能とされている。なお、成型型34Bには切欠凹部20を形成するためにこの切欠凹部20と対応する凸部35が形成される。そして成形の際には、外筒14およびセンター部材12が成型型にセットされ、この状態で各成型型によって囲まれた空間内に弾性材料を図示しない導入路から注入した後、加熱されて加硫成形が行われる。

【0019】次に本実施例の作用を説明する。

【0020】センター部材12に搭載されるエンジンが作動すると、エンジンの振動がセンター部材12を介して弾性体18へ伝達される。弾性体18は吸振主体として作用し、弾性体18の内部摩擦に基づく制振機能によって振動を吸収することができる。さらに、弾性体18の変形に合わせて受圧液室26Aが拡張し受圧液室26A内の液体に圧力変化が生じるのに伴って、液体が制限通路30を通して受圧液室26Aとダイヤフラム24に

より拡張可能とされている副液室26Bとの間で相互に流通し、制限通路30内で生ずる液体の液柱共振等に基づく減衰作用で防振効果を向上することができる。

【0021】また、制限通路30が目詰まりした場合でも、例えば200Hz近辺の周波数あるいはそれ以上の高周波数域の振動に対して、弾性体18に設けた薄肉部22の変形によって低動ばね係数となり、受圧液室26A内の液圧上昇が防がれて、車体側に振動が伝達され難くなる。

【0022】また、上述のような構造にすれば、薄肉部22を形成するための切欠凹部20が弾性体18の液室26側ではなく外方側に形成されるので、液室26側に凹部を形成するのに比べ、液室26内に封入される液体の量が増加することがなく、重量の増加を防止できコストも増加することがない。さらに、切欠凹部20は軸直交方向外方に向かって開放されるよう凹設され、切欠凹部に異物が溜まり難く、また異物が入り込んでも容易に排出され易く、適切な振動減衰が出来なくなる危惧がない。特に、図1の状態から反時計方向に90度回転させた状態で使用される場合には好適である。また切欠凹部20は軸直交方向外方に向かって開放されるよう凹設されており、軸直交方向に関し外方から内方に向かって進行きが広がるような構成でないので、弾性体の加硫成形時に軸直交方向に型抜きが容易に行えて製造が簡易である。

【0023】なお、上述の例では、エンジンにセンター部材12を連結し、車体に外筒14側を連結するような構成としたが、この逆の構成としてもよい。また、切欠凹部は軸直交方向に関し平行あるいは外方に向かって拡

開されるような内壁面により構成されていればよく、また軸方向にも開放されるよう形成されてもよい。また、上述の例では、車両に搭載されるエンジンの防振を目的としたが、本発明の防振装置は他の用途にも用いられることはいうまでもなく、また、部材の形状等も実施例のものに限定されるものではない。

【0024】

【発明の効果】以上説明したように、本発明は上述の構成により、簡易で安価な構成で製造が容易となって、異物の侵入・滞留が防止可能で且つ広範囲な帯域の振動を有効に吸収し得るという優れた効果が生じる。

【図面の簡単な説明】

【図1】本発明の一実施例を示した縦断面図である。

【図2】本発明の一実施例を示した平面図である。

【図3】本発明の一実施例にかかるゴム状弾性体の製造を説明する縦断面図である。

【図4】従来技術を示した縦断面図である。

【図5】従来技術を示した縦断面図である。

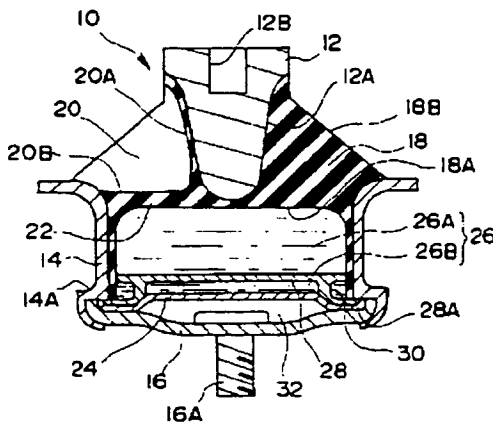
【図6】従来技術を示した縦断面図である。

【図7】従来技術を示した縦断面図である。

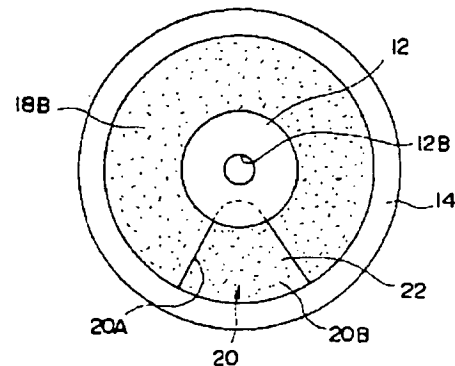
【符号の説明】

- 12 センター部材
- 14 外筒
- 18 弾性体
- 20 切欠凹部
- 22 薄肉部
- 24 ダイヤフラム
- 26A 受圧液室（液室）
- 26B 副液室（液室）

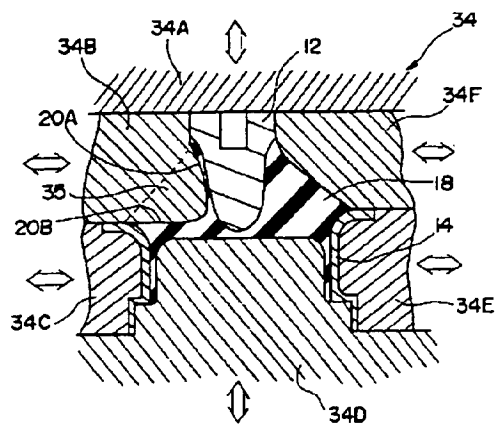
【図1】



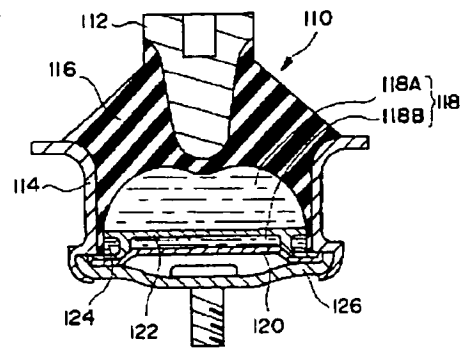
【図2】



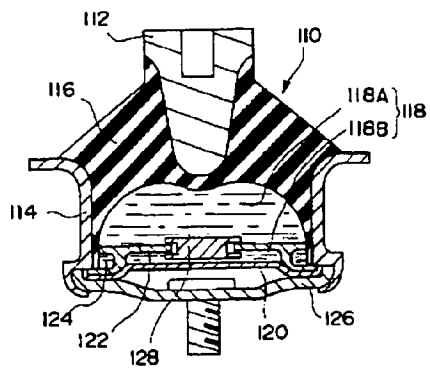
【図3】



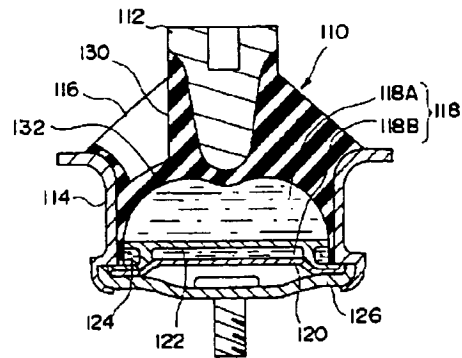
【図4】



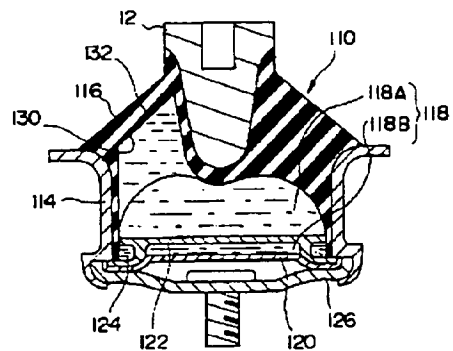
【図5】



【図6】



【図7】



JP 09-014333

Date of Publication of Application: 14.01.1997

International Classification F16F 13/18
B60K 5/12

Application Number: 07-162708
Date of Filing: 28.06.1995

Applicant: Bridgestone Corporation
Inventor: Matsuda Naohisa

VIBRATION CONTROL DEVICE

[Detailed Description of the Invention]

[0001] *[Industrial Application]* This invention is applicable to an engine mount, its object for the other cars, a general industrial airframe, etc. for preventing transfer into the body of engine vibration, concerning the vibration isolator applied when preventing transfer of the vibration from the oscillating generating section.

[0002] *[Description of the Prior Art]* For example, the vibration isolator as an engine mount is arranged between the bodies used as the engine used as the oscillating generating section of vehicles, and an oscillating receiving part, this vibration isolator absorbs vibration, which an engine generates, and it prevents being transmitted to a body side. That is, the vibration isolator 110 as shown in drawing 4 is known as an example of such a vibration isolator, and the conventional technology is explained based on this drawing.

[0003] The pin center, large where this vibration isolator 110 is attached in the bracket by the side of an engine -- while the elastic body 116 which consists of rubber is formed between a member 112 and an outer case 114 and the liquid room 118 which enclosed the liquid is formed inside an outer case 114 and an elastic body 116, it is constituted by sealing this liquid room 118 with the diaphragm 120 which consists of a rubber membrane the inside of the liquid room 118 -- a septum -- it is divided by the member 122 at the liquid rooms 118A and 118B of a couple, and these liquid rooms 118A and 118B are mutually opened for free passage by the limit path 124 this septum -- in case the covering device material 126 is fixed to a part for opening of an outer case 114, a member 122 and a diaphragm 120 are attached when pinched by these both The covering device material 126 is attached in a body side by bolt 126A, therefore the outer case 114 of the covering device material 126 and one is attached in the body side through this covering device material 126. And when the carried engine operates and vibration occurs, by liquid column resonance of the liquid in the limit path 124 which opens the damping function and the liquid rooms 118A and 118B of an elastic body 116 for free passage etc., a damping force is generated, vibration is absorbed and transfer of vibration is prevented.

[0004] *[Problem(s) to be Solved by the Invention]* However, in the above vibration

isolators 110, when vibration of a high-frequency region was transmitted from this to vibration of a low frequency region decreasing the limit path 124 when a liquid circulates, by the blinding of the limit path 124, the internal pressure of liquid room 118A rose, the spring modulus increased, and it had as a result the fault that vibration could not fully be reduced.

[0005] Moreover, a septum as shown in drawing 5 that this fault should be solved -- although the thing equipped with the movable piece 128 which can reciprocate to a member 122, or the thing equipped with the membrane which consists of a rubber membrane instead of the movable piece 128 is proposed, structure becomes complicated, these things have complicated manufacture and the fault which part mark increase and carries out a cost rise produces them.

[0006] Furthermore, although the thing of composition of preventing that establish a crevice 130 in an elastic body 116, form a thin-walled part 132, and the internal pressure of liquid room 118A rises is also proposed as shown in drawing 6 and drawing 7 The fault which the amount of the liquid enclosed with the liquid interior of a room increases since the crevice 130 is formed in the liquid room side, and an equipment weight increases produces the thing of drawing 5. The thing of drawing 6 It will be hard to be discharged, once a foreign matter tends to collect in a crevice 130 and a foreign matter enters, since a form block is made to release from mold to the upper part in drawing and the crevice 130 is made to cut in shaft orientations. This pin center, large from the relation of mold release of a form block when the pin center, large member from which outer diameters, such as with the stage, differ further, for example is used -- being able to be fully hard to secure the area of a thin-walled part, since a crevice 130 cannot be formed in a center side from the diameter of the outermost of a member, these things also become have a bad influence on the property of equipment.

[0007] This invention aims at offering the vibration isolator, which may absorb vibration of a wide range band effectively with simple composition in consideration of the above-mentioned fact.

[0008] [*Means for Solving the Problem*] The outer case by which this invention is connected with either the oscillating generating section or an oscillating receiving part, and the pin center, large member connected with another side of the oscillating generating section and an oscillating receiving part, The rubber-like elasticity object by which mediation arrangement was carried out between the aforementioned outer case and the aforementioned pin center, large member, So that it may be the vibration isolator equipped with the liquid room where this rubber-like elasticity object was used as a part of septum, and the liquid was enclosed and some aforementioned rubber-like elasticity objects which attend the aforementioned liquid room may serve as a thick thin-walled part The aforementioned liquid room establishes a notch crevice in a part for the aforementioned rubber-like elasticity soma used as an opposite side, further, a groove is cut and this notch crevice becomes so that it may be wide opened toward the method of the outside of the axial rectangular cross direction at least.

[0009] *[Function]* according to the above-mentioned composition of this invention -- the pin center, large from an oscillating generating section side -- if vibration is transmitted to a member or an outer case, while an elastic body will deform, pressure variation arises into the liquid of the liquid interior of a room, vibration declines with an elastic body and a liquid, and vibration becomes is hard to be transmitted to an oscillating receiving part side Moreover, even when vibration of the RF which cannot be decreased since the thin-walled part is formed in the elastic body which constitutes the septum of a liquid room of the notch crevice is transmitted from an oscillating generating section side depending on an elastic body and a liquid, this thin-walled part carries out elastic deformation, it becomes low, and vibration becomes is hard to be transmitted to an oscillating receiving part side.

[0010] Furthermore, since a notch crevice is formed in the outside instead of the liquid room side of an elastic body, compared with forming a crevice in a liquid room side, its amount of the liquid enclosed with the liquid interior of a room increases and is little, it ends, and lightweightizing of the part is possible for it. Moreover, since a notch crevice is cut so that it may be wide opened toward the method of the outside of the axial rectangular cross direction at least, although a notch crevice cannot be easily covered with a foreign matter and a foreign matter enters, it is easy to be discharged easily, and there is no fear of suitable periodic damping becoming impossible. Moreover, mold omission can be easily performed at the time of vulcanization fabrication of an elastic body, and manufacture is simple.

[0011] *[Example]* Below, the suitable example of this invention is explained with reference to a drawing.

[0012] The steel which forms the upper part side of a vibration isolator 10 in the example shown in drawing 1 -- the pin center, large of an approximate circle drill configuration -- bolt hole 12B for connecting this vibration isolator 10 with the engine which is not illustrated, and fixing is prepared in a part for the center section of a member 12 this pin center, large -- the circumference by the side of the lower part of a member 12 is taper-like wall 12A On the other hand, the outer case 14 is formed in the shape of a cylinder by the product made from a steel plate. The medial-axis line top position of the method of the inside of the direction of a path of this outer case 14 -- and the position shifted in the direction of an axis -- a pin center, large -- a member 12 is arranged Caulking fixation of the covering device material 16 made from a steel plate is carried out at lower part side opening of an outer case 14, and this covering device material 16 is attached in the body flank material which has bolt 16A and is not illustrated by this bolt 16A. Therefore, an outer case 14 will be connected with a body side by being fixed with a group in one with the covering device material 16.

[0013] Moreover, a pin center, large -- between the member 12 and the outer case 14, the elastic body 18 made of rubber which carried out the truncated-cone configuration in general is arranged That is, by part for the center section, vulcanization adhesion is carried out and the elastic body 18 is attached in wall 12A of the pin center, large portion

12, and in the lower periphery portion of an elastic body 18, vulcanization adhesion is carried out and it is attached in the up inner circumference side of an outer case 14. Inferior-surface-of-tongue 18A of an elastic body 18 is constituted as a part of septum of a liquid room so that it may mention later, and the elastic body 18 is installed in the shape of a film from the fixing portion with an outer case 14 to the inner circumference soffit of an outer case 14.

[0014] Vulcanization fabrication of the elastic body 18 is carried out so that the notch crevice 20 may be formed in a part of the inclined plane 18B. This notch crevice 20 -- a pin center, large -- it consists of standing wall section 20A which started along with the member 12, and base 20B installed along the axial rectangular cross direction

[0015] Base 20B is made into the abbreviation sector configuration which one side is radii and was extended from the inner direction toward this one side to the method of outside as shown in drawing 2 , and the notch crevice 20 is wide opened by this here at the method of the outside of the direction of a path. Moreover, the inner direction side of base 20B -- a pin center, large -- it is formed so that it may enter into a medial-axis line side rather than the diameter of the outermost of a member 12 (path by the side of a bolt hole 12B formation portion) Moreover, this base 20B is formed so that it may become an parallel field to inferior-surface-of-tongue 18A, therefore thickness is formed thinly and the elastic body 18 between these both sides serves as a thin-walled part 22. In addition, the thickness of a thin-walled part 22 is formed in 2-4mm in this example. On the other hand -- standing wall section 20A -- the inner direction side of base 20B -- setting -- a pin center, large -- it is formed so that it may start along with a member 12 and may start to an abbreviation perpendicular an inner direction side and in addition to a radii side portion

[0016] The diaphragm 24 which consists of a rubber membrane so that a part for the opening may be covered is attached to the soffit of an outer case 14. And liquids, such as water and ethylene glycol, are enclosed and, as for sealing sky surrounded by the elastic body 18, the outer case 14, and the diaphragm 24, the liquid room 26 is formed. Furthermore, in this liquid room 26, the curtain board 28 made of synthetic resin formed in disc-like is arranged. This curtain board 28 has bisected and divided the liquid room 26 to pressure-receiving liquid room 26A and subliquid room 26B which are the liquid room of a couple. Moreover, **** which carried out opening to the shape of a cross-section KO character is formed in the periphery of a curtain board 28, and in case a curtain board 28 is attached to the method of the inside of an outer case 14, the limit path 30 which is ring-like space is formed by plugging up opening of the aforementioned **** in the inner circle wall side of an outer case 14. In addition, it is mostly formed in the circumference of a curtain board 28 over the perimeter over the semicircle, and the end is open for free passage with pressure-receiving liquid room 26A with bore 30A, and the other end is opening this limit path 30 for free passage with subliquid room 26B by bore 30B.

[0017] Supporter 28A projected to the method of the outside of the direction of a path is formed in the curtain board 28, and pinching fixation of this supporter 28A is carried out with the periphery section of a diaphragm 24 by flange 14A of an outer case 14, and the

covering device material 16. It makes deformation of a diaphragm 24 possible, space between a diaphragm 24 and the covering device material 16 being used as an air chamber 32.

[0018] Drawing 3 is for explaining manufacture by vulcanization fabrication of an elastic body 18, a form block 34 is divided and constituted by upper form-block 34A, form-block 34B, form-block 34C, lower form-block 34D, form-block 34E, and form-block 34F, and as shown by the arrow in drawing, the slide of each form block is enabled relatively. In addition, in order to form the notch crevice 20 in form-block 34B, this notch crevice 20 and the heights 35 are formed and -- the time of fabrication -- an outer case 14 and a pin center, large -- a member 12 is set to a form block, it is heated and vulcanization fabrication is performed, after pouring in into the space surrounded by each form block in this state from the introductory way which does not illustrate elastic material.

[0019] Next, an operation of this example is explained.

[0020] A pin center, large -- if the engine carried in a member 12 operates -- vibration of an engine -- a pin center, large -- it is transmitted to an elastic body 18 through a member 12. An elastic body 18 can act as an absorption subject, and can absorb vibration by the damping function based on internal friction of an elastic body 18. Furthermore, the vibration proofing effect can improve by the attenuation based on liquid column resonance of the liquid which circulates mutually between the subliquid room 26 B by which expanding and contracting of a liquid are enabled with pressure-receiving liquid room 26 A and a diaphragm 24 through a limit path 30 in connection with pressure-receiving liquid room 26 A expanding and contracting according to deformation of an elastic body 18, and pressure variation arising into the liquid in pressure-receiving liquid room 26 A, and produces in a limit path 30 etc.

[0021] Moreover, even when the limit path 30 carries out blinding, for example to vibration of the frequency of nearly 200Hz, or the high-frequency region beyond it, it becomes low ***** by deformation of the thin-walled part 22 prepared in the elastic body 18, the fluid-pressure elevation in pressure-receiving liquid room 26A is prevented, and vibration becomes is hard to be transmitted to a body side.

[0022] Moreover, if it is made the above structures, since the notch crevice 20 for forming a thin-walled part 22 will be formed in the method [not the liquid room 26 of an elastic body 18 but] side of outside, compared with forming a crevice in the liquid room 26 side, the amount of the liquid enclosed in the liquid room 26 does not increase, weight increase can be prevented and cost does not increase, either. Furthermore, a groove is cut so that it may be wide opened toward the method of the outside of the axial rectangular cross direction, a notch crevice cannot be easily covered with a foreign matter, and the notch crevice 20 is easy to be discharged easily, although a foreign matter enters, and it does not have a fear of suitable periodic damping becoming impossible. It is suitable, when being used, where a counterclockwise rotation is especially rotated 90 degrees from the state of drawing 1. Moreover, the notch crevice 20 is cut so that it may be wide

THIS PAGE BLANK (USPTO)

opened toward the method of the outside of the axial rectangular cross direction, since it is not the composition that depth spreads toward the inner direction about the axial rectangular cross direction from the method of outside, mold omission can be easily performed in the axial rectangular cross direction at the time of vulcanization fabrication of an elastic body, and manufacture is simple.

[0023] In addition -- an above-mentioned example -- an engine -- a pin center, large -- although considered as composition which connects a member 12 and connects an outer case 14 side with the body, it is good also as this reverse composition. Moreover, that what is necessary is to just be constituted by internal surface which is extended toward parallel or the method of outside about the axial rectangular cross direction, a notch crevice may be formed so that it may be wide opened by shaft orientations. Moreover, although it aimed at vibration proofing of the engine carried in vehicles in the above-mentioned example, to say nothing of being used for other uses, the configuration of a member etc. is not limited to the thing of an example by the vibration isolator of this invention.

[0024] *[Effect of the Invention]* As explained above, by above-mentioned composition, manufacture becomes easy with simple and cheap composition, and the outstanding effect that vibration of a wide range band [prevent / an invasion and stay of a foreign matter / and] may be absorbed effectively produces this invention.

CLAIMS

[Claim(s)]

[Claim 1] The outer case connected with either the oscillating generating section or an oscillating receiving part, the pin center, large connected with another side of the oscillating generating section and an oscillating receiving part -- a member The rubber-like elasticity object by which intervention arrangement was carried out between the aforementioned outer case and the aforementioned pin center, large member. The liquid room where this rubber-like elasticity object was used as a part of septum, and the liquid was enclosed. It is the vibration isolator equipped with the above, and the aforementioned liquid room establishes a notch crevice in a part for the aforementioned rubber-like elasticity soma used as an opposite side, and further, this notch crevice is cut so that it may be wide opened toward the method of the outside of the axial rectangular cross direction at least, and is characterized by the bird clapper so that some aforementioned rubber-like elasticity objects which attend the aforementioned liquid room may serve as a thick thin thin-walled part.

TECHNICAL FIELD

[Industrial Application] This invention is applicable to an engine mount, its object for the other cars, a general industrial airframe, etc. for preventing transfer into the body of

THIS PAGE BLANK (USPTO)

engine vibration, concerning the vibration isolator applied when preventing transfer of the vibration from the oscillating generating section.

[*Description of the Prior Art*] For example, the vibration isolator as an engine mount is arranged between the bodies used as the engine used as the oscillating generating section of vehicles, and an oscillating receiving part, this vibration isolator absorbs vibration, which an engine generates, and it prevents being transmitted to a body side. That is, the vibration isolator 110 as shown in drawing 4 is known as an example of such a vibration isolator, and the conventional technology is explained based on this drawing. The pin center, large where this vibration isolator 110 is attached in the bracket by the side of an engine -- while the elastic body 116 which consists of rubber is formed between a member 112 and an outer case 114 and the liquid room 118 which enclosed the liquid is formed inside an outer case 114 and an elastic body 116, it is constituted by sealing this liquid room 118 with the diaphragm 120 which consists of a rubber membrane the inside of the liquid room 118 -- a septum -- it is divided by the member 122 at the liquid rooms 118A and 118B of a couple, and these liquid rooms 118A and 118B are mutually opened for free passage by the limit path 124 this septum -- in case the covering device material 126 is fixed to a part for opening of an outer case 114, a member 122 and a diaphragm 120 are attached when pinched by these both The covering device material 126 is attached in a body side by bolt 126A, therefore the outer case 114 of the covering device material 126 and one is attached in the body side through this covering device material 126. And when the carried engine operates and vibration occurs, by liquid column resonance of the liquid in the limit path 124 which opens the damping function and the liquid rooms 118A and 118B of an elastic body 116 for free passage etc., a damping force is generated, vibration is absorbed and transfer of vibration is prevented.

EFFECT OF THE INVENTION

[*Effect of the Invention*] As explained above, by above-mentioned composition, manufacture becomes easy with simple and cheap composition, and the outstanding effect that vibration of a wide range band [prevent / invasion and stay of a foreign matter /and] may be absorbed effectively produces this invention.

TECHNICAL PROBLEM

[*Problem(s) to be Solved by the Invention*] However, in the above vibration isolators 110, when vibration of a high-frequency region was transmitted from this to vibration of a low frequency region decreasing the limit path 124 when a liquid circulates, by the blinding of the limit path 124, the internal pressure of liquid room 118A rose, the spring modulus increased, and it had as a result the fault that vibration could not fully be reduced.

THIS PAGE BLANK (USPTO)

Moreover, a septum as shown in drawing 5 that this fault should be solved -- although the thing equipped with the movable piece 128 which can reciprocate to a member 122, or the thing equipped with the membrane which consists of a rubber membrane instead of the movable piece 128 is proposed, structure becomes complicated, these things have complicated manufacture and the fault which part mark increase and carries out a cost rise produces them.

Furthermore, although the thing of composition of preventing that establish a crevice 130 in an elastic body 116, form a thin-walled part 132, and the internal pressure of liquid room 118A rises is also proposed as shown in drawing 6 and drawing 7 The fault which the amount of the liquid enclosed with the liquid interior of a room increases since the crevice 130 is formed in the liquid room side, and an equipment weight increases produces the thing of drawing 5. The thing of drawing 6 will be hard to be discharged, once a foreign matter tends to collect in a crevice 130 and a foreign matter enters, since a form block is made to release from mold to the upper part in drawing and the crevice 130 is made to cut in shaft orientations. This pin center, large from the relation of mold release of a form block when the pin center, large member from which outer diameters, such as with the stage, differ further, for example is used -- being able to be fully hard to secure the area of a thin-walled part, since a crevice 130 cannot be formed in a center side from the diameter of the outermost of a member, these things also become have a bad influence on the property of equipment.

This invention aims at offering the vibration isolator which may absorb vibration of a wide range band effectively with simple composition in consideration of the above-mentioned fact.

MEANS

[*Means for Solving the Problem*] The aforementioned liquid room establishes a notch crevice in a part for the aforementioned rubber-like elasticity soma used as an opposite side, further, a groove is cut and this notch crevice becomes so that it may be wide opened toward the method of the outside of the axial rectangular cross direction at least so that it may become the thin thin-walled part with some aforementioned thick rubber-like elasticity objects which are vibration isolators and attend the aforementioned liquid room characterized by this invention possessing the following. The outer case connected with either the oscillating generating section or an oscillating receiving part. The pin center, large connected with another side of the oscillating generating section and an oscillating receiving part -- a member The rubber-like elasticity object by which mediation arrangement was carried out between the aforementioned outer case and the aforementioned pin center, large member. The liquid room where this rubber-like elasticity object was used as a part of septum, and the liquid was enclosed.

THIS PAGE BLANK (USPTO)

OPERATION

[Function] According to the above-mentioned composition of this invention -- the pin center, large from an oscillating generating section side -- if vibration is transmitted to a member or an outer case, while an elastic body will deform, pressure variation arises into the liquid of the liquid interior of a room, vibration declines with an elastic body and a liquid, and vibration becomes is hard to be transmitted to an oscillating receiving part side Moreover, even when vibration of the RF which cannot be decreased since the thin-walled part is formed in the elastic body which constitutes the septum of a liquid room of the notch crevice is transmitted from an oscillating generating section side depending on an elastic body and a liquid, this thin-walled part carries out elastic deformation, it becomes low *****, and vibration becomes is hard to be transmitted to an oscillating receiving part side.

Furthermore, since a notch crevice is formed in the outside instead of the liquid room side of an elastic body, compared with forming a crevice in a liquid room side, its amount of the liquid enclosed with the liquid interior of a room increases and is little, it ends, and lightweightizing of the part is possible for it. Moreover, since a notch crevice is cut so that it may be wide opened toward the method of the outside of the axial rectangular cross direction at least, although a notch crevice cannot be easily covered with a foreign matter and a foreign matter enters, it is easy to be discharged easily, and there is no fear of suitable periodic damping becoming impossible. Moreover, mold omission can be easily performed at the time of vulcanization fabrication of an elastic body, and manufacture is simple.

EXAMPLE

[Example] Below, the suitable example of this invention is explained with reference to a drawing.

The steel which forms the upper part side of a vibration isolator 10 in the example shown in drawing 1 -- the pin center, large of an approximate circle drill configuration -- bolt hole 12B for connecting this vibration isolator 10 with the engine which is not illustrated, and fixing is prepared in a part for the center section of a member 12 this pin center, large -- the circumference by the side of the lower part of a member 12 is taper-like wall 12A.

On the other hand, the outer case 14 is formed in the shape of a cylinder by the product made from a steel plate. The medial-axis line top position of the method of the inside of the direction of a path of this outer case 14 -- and the position shifted in the direction of an axis -- a pin center, large -- a member 12 is arranged. Caulking fixation of the covering device material 16 made from a steel plate is carried out at lower part side opening of an outer case 14, and this covering device material 16 is attached in the body flank material which has bolt 16A and is not illustrated by this bolt 16A. Therefore, an

THIS PAGE BLANK (USPTO)

outer case 14 will be connected with a body side by being fixed with a group in one with the covering device material 16.

Moreover, a pin center, large -- between the member 12 and the outer case 14, the elastic body 18 made of rubber which carried out the truncated-cone configuration in general is arranged. That is, by part for the center section, vulcanization adhesion is carried out and the elastic body 18 is attached in wall 12A of the pin center, large portion 12, and in the lower periphery portion of an elastic body 18, vulcanization adhesion is carried out and it is attached in the up inner circumference side of an outer case 14. Inferior-surface-of-tongue 18A of an elastic body 18 is constituted as a part of septum of a liquid room so that it may mention later, and the elastic body 18 is installed in the shape of a film from the fixing portion with an outer case 14 to the inner circumference soffit of an outer case 14.

Vulcanization fabrication of the elastic body 18 is carried out so that the notch crevice 20 may be formed in a part of the inclined plane 18B. This notch crevice 20 -- a pin center, large -- it consists of standing wall section 20A which started along with the member 12, and base 20B installed along the axial rectangular cross direction.

Base 20B is made into the abbreviation sector configuration which one side is radii and was extended from the inner direction toward this one side to the method of outside as shown in drawing 2, and the notch crevice 20 is wide opened by this here at the method of the outside of the direction of a path. Moreover, the inner direction side of base 20B -- a pin center, large -- it is formed so that it may enter into a medial-axis line side rather than the diameter of the outermost of a member 12 (path by the side of a bolt hole 12B formation portion). Moreover, this base 20B is formed so that it may become an parallel field to inferior-surface-of-tongue 18A, therefore thickness is formed thinly and the elastic body 18 between these both sides serves as a thin-walled part 22. In addition, the thickness of a thin-walled part 22 is formed in 2-4mm in this example. On the other hand -- standing wall section 20A -- the inner direction side of base 20B -- setting -- a pin center, large -- it is formed so that it may start along with a member 12 and may start to an abbreviation perpendicular an inner direction side and in addition to a radii side portion

The diaphragm 24 which consists of a rubber membrane so that a part for the opening may be covered is attached to the soffit of an outer case 14. And liquids, such as water and ethylene glycol, are enclosed and, as for sealing sky surrounded by the elastic body 18, the outer case 14, and the diaphragm 24, the liquid room 26 is formed. Furthermore, in this liquid room 26, the curtain board 28 made of synthetic resin formed in disc-like is arranged. This curtain board 28 has bisected and divided the liquid room 26 to pressure-receiving liquid room 26A and subliquid room 26B which are the liquid room of a couple. Moreover, **** which carried out opening to the shape of a cross-section KO character is formed in the periphery of a curtain board 28, and in case a curtain board 28 is attached to the method of the inside of an outer case 14, the limit path 30 which is ring-like space is formed by plugging up opening of the aforementioned **** in the inner circle wall side of an outer case 14. In addition, it is mostly formed in the circumference

THIS PAGE BLANK (USPTO)

of a curtain board 28 over the perimeter over the semicircle, and the end is open for free passage with pressure-receiving liquid room 26A with bore 30A, and the other end is opening this limit path 30 for free passage with subliquid room 26B by bore 30B.

Supporter 28A projected to the method of the outside of the direction of a path is formed in the curtain board 28, and pinching fixation of this supporter 28A is carried out with the periphery section of a diaphragm 24 by flange 14A of an outer case 14, and the covering device material 16. It makes deformation of a diaphragm 24 possible, space between a diaphragm 24 and the covering device material 16 being used as an air chamber 32.

Drawing 3 is for explaining manufacture by vulcanization fabrication of an elastic body 18, a form block 34 is divided and constituted by upper form-block 34A, form-block 34B, form-block 34C, lower form-block 34D, form-block 34E, and form-block 34F, and as shown by the arrow in drawing, the slide of each form block is enabled relatively. In addition, in order to form the notch crevice 20 in form-block 34B, this notch crevice 20 and the heights 35 are formed and -- the time of fabrication -- an outer case 14 and a pin center, large -- a member 12 is set to a form block, it is heated and vulcanization fabrication is performed, after pouring in into the space surrounded by each form block in this state from the introductory way which does not illustrate elastic material.

Next, an operation of this example is explained.

A pin center, large -- if the engine carried in a member 12 operates -- vibration of an engine -- a pin center, large -- it is transmitted to an elastic body 18 through a member 12. An elastic body 18 can act as an absorption subject, and can absorb vibration by the damping function based on internal friction of an elastic body 18. Furthermore, the vibration proofing effect can improve by the attenuation based on liquid column resonance of the liquid which circulates mutually between the subliquid room 26 B by which expanding and contracting of a liquid are enabled with pressure-receiving liquid room 26 A and a diaphragm 24 through a limit path 30 in connection with pressure-receiving liquid room 26 A expanding and contracting according to deformation of an elastic body 18, and pressure variation arising into the liquid in pressure-receiving liquid room 26 A, and produces in a limit path 30 etc.

Moreover, even when the limit path 30 carries out blinding, for example to vibration of the frequency of nearly 200Hz, or the high-frequency region beyond it, it becomes low ***** by deformation of the thin-walled part 22 prepared in the elastic body 18, the fluid-pressure elevation in pressure-receiving liquid room 26A is prevented, and vibration becomes is hard to be transmitted to a body side.

Moreover, if it is made the above structures, since the notch crevice 20 for forming a thin-walled part 22 will be formed in the method [not the liquid room 26 of an elastic body 18 but] side of outside, compared with forming a crevice in the liquid room 26 side, the amount of the liquid enclosed in the liquid room 26 does not increase, weight increase can be prevented and cost does not increase, either. Furthermore, a groove is cut so that it may be wide opened toward the method of the outside of the axial rectangular cross

THIS PAGE BLANK (USPTO)

direction, a notch crevice cannot be easily covered with a foreign matter, and the notch crevice 20 is easy to be discharged easily, although a foreign matter enters, and it does not have a fear of suitable periodic damping becoming impossible. It is suitable, when being used, where a counterclockwise rotation is especially rotated 90 degrees from the state of drawing 1. Moreover, the notch crevice 20 is cut so that it may be wide opened toward the method of the outside of the axial rectangular cross direction, since it is not the composition that depth spreads toward the inner direction about the axial rectangular cross direction from the method of outside, mold omission can be easily performed in the axial rectangular cross direction at the time of vulcanization fabrication of an elastic body, and manufacture is simple.

In addition -- an above-mentioned example -- an engine -- a pin center, large -- although considered as composition which connects a member 12 and connects an outer case 14 side with the body, it is good also as this reverse composition. Moreover, that what is necessary is to just be constituted by internal surface which is extended toward parallel or the method of outside about the axial rectangular cross direction, a notch crevice may be formed so that it may be wide opened by shaft orientations. Moreover, although it aimed at vibration proofing of the engine carried in vehicles in the above-mentioned example, to say nothing of being used for other uses, the configuration of a member etc. is not limited to the thing of an example by the vibration isolator of this invention.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing of longitudinal section having shown one example of this invention.

[Drawing 2] It is the plan having shown one example of this invention.

[Drawing 3] It is drawing of longitudinal section explaining manufacture of the rubber-like elasticity object concerning one example of this invention.

[Drawing 4] It is drawing of longitudinal section having shown the conventional technology.

[Drawing 5] It is drawing of longitudinal section having shown the conventional technology.

[Drawing 6] It is drawing of longitudinal section having shown the conventional technology.

[Drawing 7] It is drawing of longitudinal section having shown the conventional technology.

[Description of Notations]

12 Pin Center, large -- Member

14 Outer Case

18 Elastic Body

20 Notch Crevice

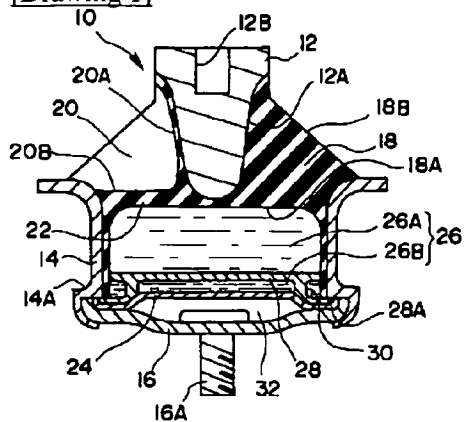
22 Thin-walled Part

THIS PAGE BLANK (USPTO)

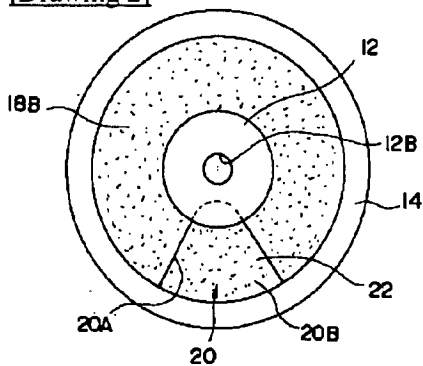
24 Diaphragm
 26A pressure-receiving liquid room (liquid room)
 26B secondary liquid room (liquid room)

DRAWINGS

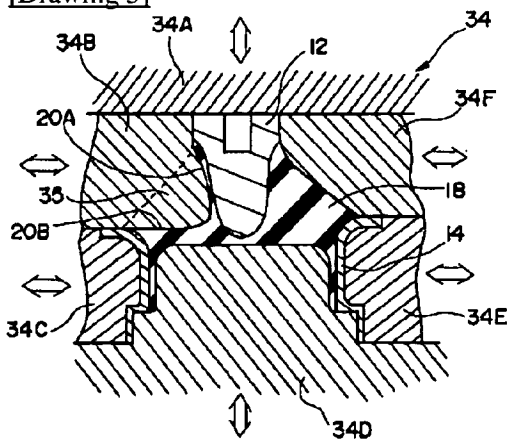
[Drawing 1]



[Drawing 2]

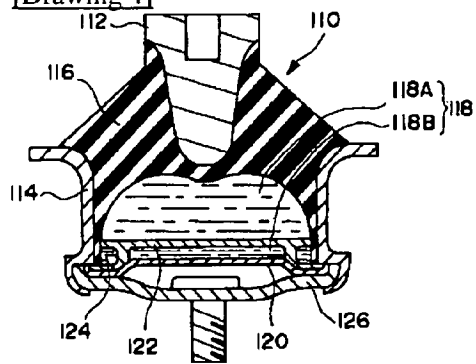


[Drawing 3]

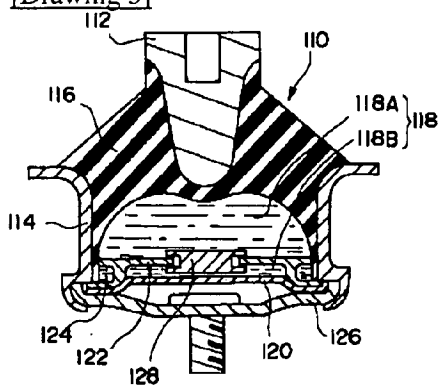


THIS PAGE BLANK (USPTO)

[Drawing 4]

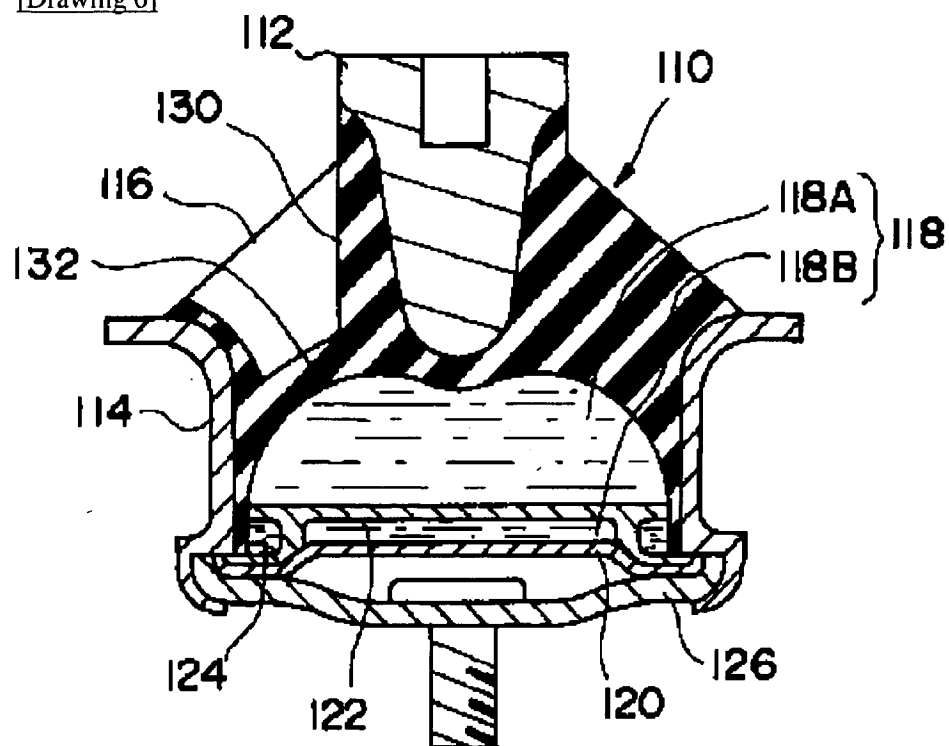


[Drawing 5]

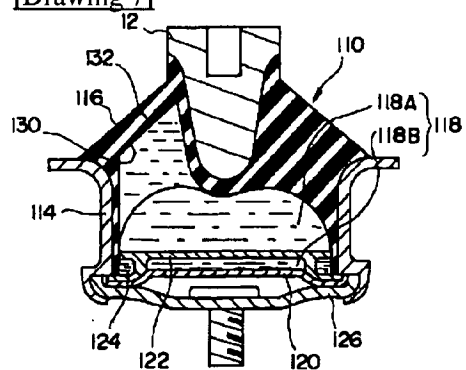


THIS PAGE BLANK (USPTO)

[Drawing 6]



[Drawing 7]



THIS PAGE BLANK (USPTO)